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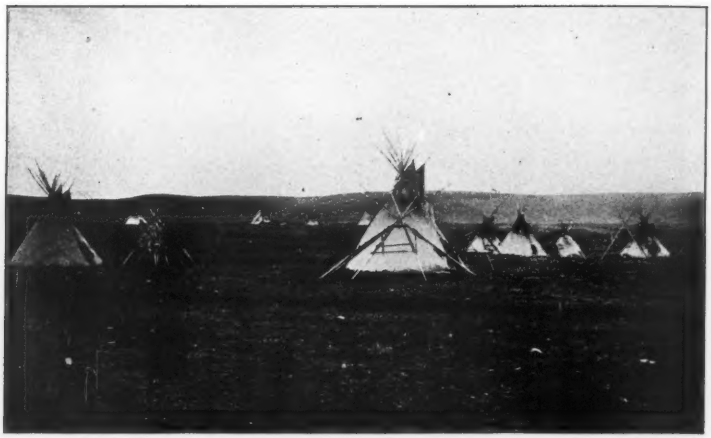

THE PRAIRIES OF DAKOTA.

THE DESERT OF UTAH.

THE CALIFORNIA FOREST.

THE FORESTER.

VOLUME III. AUGUST 1, 1897. No. 8.

THE FORESTER.

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THE FORESTER contains articles pertaining to all branches of Forestry: The Prevention and Extinguishment of Forest Fires, Improved Methods of Cutting, Useful and Injurious Insects and Fungi, Useful Birds, the Establishment of City Forests, State and Federal Reservations, Water Supply, Forest Legislation, Forest Influences, Forest Utilization, Forest Products, Road Construction, Reclamation of Waste Lands, etc., etc.

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We desire to acknowledge with thanks the receipt of "Forstpolitik—Jagd, und Fischereipolitik," by Dr. Adam Schwappach, from Dr. F. Fankhauser, Bern, Switzerland.

THE University of Wisconsin has recently conferred the degree of LL.D. upon Mr. B. E. Fernow, Chief of the Forestry Division. This is a fitting tribute to the energy and ability of the man who has done as much as any other in America to bring the American people to their senses in reference to their forests. "*Qu'il va toujours et n'est pas encore fatigue.*"

IN the June number of the *National Geographic Magazine* there is an instructive article on the National Forest Reserves. This contribution is of special interest because its author, Mr. F. H. Newell, being hydrographer for the United States Geological Survey, and Secretary of the American Forestry Association, is familiar with the nature of the West, and every step in the movement which has led to the survey now in progress. The Forestry Division, the General Land Office, the Botanical Division, the United States Geological Survey, all have representatives in the great forest regions of the West gathering information, which, if it does not culminate in the proper protection and utilization of the Federal forests, will arouse interest in the subject throughout the country, and furnish valuable data for the construction of maps, compilation of geographies and a basis for some future action.

Few people appreciate the vastness, diversity and unsettled nature of the major part of the land west of the Mississippi. The frontispiece of this issue shows three typical scenes—the desert, the prairie, and the forest. The idea is prev-

alent that the United States has given all its land away to companies and settlers, and that the reservations recently proclaimed embrace the forest residue. The truth is, the United States, besides immense tracts of forests, owns millions of acres of land which no sane man would have for a gift. Mr. Newell says in the article mentioned above that the United States is still among the great land owners of the world, that fully two-thirds of the Western land surface is open to settlers, and in many Western States less than one-fourth of it is subject to taxation. The Western half of the Dakotas and Nebraska, not to mention Arizona, New Mexico, Nevada, Utah and other States, are practically uninhabited. The prime necessity is water, without which there is neither grazing nor forest. "Everything, therefore," says Mr. Newell, "that affects the supply of water in a land of drouth must be looked upon with the keenest solicitude, not only by the inhabitants of the country but by the owners of the land, the people of the United States. It would seem, therefore, as though every effort should be made to ascertain the exact value and influence of the forest, and to guard the perpetuity of the supplies of water and of wood."

Needless Slaughter of Rubber Trees.

The India-rubber trees, of which there are several profitable varieties, will produce annually from ten to forty pounds of caoutchonc for many years, if they are tapped judiciously. It is, however, an almost universal complaint, from Africa, America and Asia, that the greed and carelessness of the native collectors, who seek to obtain the greatest immediate quantity by the least laborious methods, are rapidly destroying the rubber-bearing plants. Trees are either felled or so deeply and roughly incised as to speedily die.—*Gen. Greely, in National Geographic Magazine.*

The Sand Dunes of the Pacific Coast.

BY FRANK HAINES LAMB.

The coast line of the two Californias, included between Humboldt Bay on the north and Cape San Lucas on the south, presents a wonderful similarity in general appearance, when we consider its length. Throughout this extent of about one thousand and six hundred miles of coast-line the bluffs either project into the ocean, forming bold headlands which the sea carves into a wonderful variety of shapes, or gently recede, forming bights with possibly a narrow sand beach, often almost inaccessible on account of the high, precipitous bluffs that seem to crowd them further and further into the sea. In a few instances, as at Humboldt Bay, San Francisco and San Diego, this rock-bound sea wall is broken through and excellent harbors are formed, but most of the ports are afforded no other protection than the comparatively quiet waters of a shallow bay. Behind this bold shore-line the mountains begin their ascent until the top of the California Coast Range is reached, which at Santa Lucia Peak attains an elevation of six thousand feet. This breaks down at Tehachapi and is succeeded by the San Gabriel, San Bernardino and San Jacinto Ranges in Alta California and the various ranges and cross ranges of Baja California. From the ocean back to the summits of the nearest ranges the aspect is that of a dry, barren, treeless region. Excepting in the neighborhood of the Ports it is sparsely inhabited and no one viewing it for the first time from the ocean would ever dream of the almost perfect climate, grand red wood forests, delightful valleys, broad fields, groves of luscious fruit, hidden behind its cold, bleak, rocky, fog and mist-covered slopes.

From Humboldt Bay northwards to Coos Bay in Central Oregon the coast-line gradually undergoes a change. The nearby mountains are not so high and do not approach so closely to the water. The sand beach becomes a little wider; projecting bluffs are less frequent, and the ocean slopes are covered with forests of various coniferous species. From a few miles south of Coos Bay to Yaquina

Bay there is still greater change in the coast line. The Coast Range recedes still further back from the ocean, the ranges along the coast become lower, and the sand beach becomes broad, forming shifting dunes. This coast line, nearly one hundred miles in length, is broken by the entrance of Coos Bay, with its extensive river system, the Umpqua, Suislaw, Idds, Alsea and Yaquina Rivers. Some of these form bays and estuaries behind the sand barrier very similar to those found on the New Jersey coast. The shifting sand has stopped up other inlets so that fresh water lakes have been formed. A string of these exists from the Suislaw to Coos Bay.

From Yaquina Bay north to Tillamook Head, twenty miles south of the mouth of the Columbia, the coast-line is more abrupt, the sand beach narrower, and is prevented from shifting by the precipitous sea-wall formed by the sand-stone ledges approaching nearly to the water's edge. At Tillamook Head the sand area again becomes broad, and shifting dunes are found from this point north to Point Grenville, on the coast of Washington, a distance of over eighty miles. From Point Grenville to the Straits of Juan de Fuca the coast line is very abrupt; so close do the bluffs approach the water that it is impossible to travel along the beach.

The essential features of the sand dunes of both Oregon and Washington are the same, and having spent some time close to those of Washington, I shall only speak of them. This coast-line, extending some twenty miles into Northern Oregon, is broken by the entrance of the great Columbia River and the extensive river systems of Willapa Harbor and Gray's Harbor in Western Washington. The Columbia with its many tributaries, draining as it does a large part of the States of Washington, Oregon, Idaho and a portion of the province of British Columbia, carries down to the ocean annually a vast quantity of sand and silt. The carrying capacity is still further increased by its being a comparatively swift flowing stream. In consequence great bars and sand islands are formed at its mouth, and these, until their formation was stopped by the construction of a jetty, seriously hindered navigation. These beds of sand are moved by the waves until uncovered at low tide, and when in this condition they become subject to the prevailing northwest winds and are blown inland in a southeasterly direction. The result is that in many cases the north point is a bold sand-stone bluff, with or without projecting sand-spits, while the south is invariably a long peninsula of low, shifting sand.

The width of the sand varies somewhat, but may be stated as between one and two miles. Back of this is either an enclosed lake or bay, or the sand-stone ranges begin their ascent. The sand belt may be divided into two areas, the forested and the bare sand. The bare sand constitutes that which is constantly in motion, and is destitute of all vegetation save a few scattering plants that vainly seek to obtain a foothold in the constantly moving sand. The width of this zone varies from a narrow sand beach, as at Sea Side, Oregon, to about seven thousand feet, this greater width being obtained at the various points where the sand reclaiming pine has not yet obtained a foothold.

No more beautiful region can be imagined than the pine-reclaimed zone along these coasts; the surface is gently undulating with little knolls and hollows. The Beach Pine (*Pinus contorta*, Dougl.) covers the ground almost completely, yet not so thickly but that there is plenty of room for the various species of grasses, sedges and junci that form a firm, green sod. These trees approach so closely to the ocean that they are driven backwards by the strong and almost constant northwest winds, and when their foothold is once obtained they become flat-headed, almost prostrate with their branches extending out over the sand and holding it in place, affording a protection, behind which flourish a profusion of tender and beautiful plants.

When I visited these dunes in May, Spring had already far advanced. The ground was covered with a lawn-like

turf and violets and buttercups were abundant everywhere. Among the trees where the underbrush was thicker were the high-bush and low-bush huckleberries, the salal and cranberry. All of these fruits were just in flower, but what a feast they would afford for the tramper a month later.

The bare sand zone, extending the entire length of the dunes, is peculiar on account of its width, which in some instances approaches nearly one and a half miles. In some places, as at Westport, the sand is almost destitute of vegetation and the stranger, in leaving the timber, is surprised to find the ocean a considerable distance from him and intervening a belt of pure, clear sand, shaped by the wind into all sorts of fantastic undulations, the surface of which is constantly shifting like a vast drift of dry snow on a windy day. As one looks back over this vast sand beach from the ocean he cannot but realize what a struggle the persistent scrub pines must constantly have to brave the force of the northwest gales and convert the shifting sand into firm land, affording protection for thousands of tender plants. In the more exposed situations the Beach Pine seems to be the advance agent of the approaching vegetation, but in those spots where the fury of the trade-winds are somewhat broken the sand is often completely covered and held in place by the wild strawberry. At one place these plants, then just in bloom, were so thick that they covered the sand, and lying just outside the pines, extended for miles along the beach. The ripe berries are very delicious and of course are always well sanded. Lupines, usually so abundant in such situations, were only occasionally represented by two species, and in no instance were they abundant enough to assist in reclaiming the sand. A species of bunchgrass sends its long rhizomes many feet through the sand and helps to hold it in place, but none of these plants unaided can reclaim the drifting dunes.

The Beach Pine is a low spreading tree with small and faulty trunk formation, which makes it of little value for lumber, so that the beach groves are not being sacrificed, excepting to clear land for a few small ranches. A soil is soon formed over the sand, which has been cultivated with fairly good results, and on the north side of Gray's Harbor, at Damon's Point, experiments are being made in the cultivation of the cranberry and the indications are that this will become in time a profitable industry. This region is also destined to be the popular summer resort of the Northwest and the future tendency will be to preserve the Pine, as without them the beach for miles back will soon become subject to the northwest gales and quickly covered with the drifting sand.

From the available evidence we cannot say that the sand belt along the Oregon and Washington Coast is increasing. Certainly not at any appreciable rate, for the sand formation at the present time is in no place more than three miles in width. In some places the sand is drifting in and making dunes, but in others it is being carried away equally as fast. At the entrances to the Harbors the tendency is a constant infilling, which makes necessary the expenditure of considerable money by the government, $1,000,000 having lately been appropriated for the improvement of Gray's Harbor. At Willapa Harbor and Gray's Harbor the depth of water over the bar seems to vary in regular rotation, covering a period of some dozen years. Whether this is at all influenced by the cutting of the timber on the various rivers entering the harbors is impossible to determine. It is certain that a large amount of driftwood floats down these rivers and accumulates along the shores of the bays. Much of this passes out over the bars and is cast upon the sand dunes along the coast.

The problem to be solved in studying and reclaiming the sand-dunes of Washington and Oregon is whether it is more expedient to construct littoral dunes and allow the enclosed area to become seeded with the native (*Pinus contorta*), or to reclaim it, as was done at Golden Gate Park, San Francisco, by the planting of lupines and other persistent herbaceous plants, followed by shrubs and trees. It

would be interesting to know whether *Pinus maritima* could be made to grow in these situations, as has been done on the dunes of Gascony. The present abundant supply of spruce, fir and cedar timber in the immediate neighborhood would make the proposition at this time seem fool-hardy. The chief economic results that could come from such a belt of timber along these coasts would be from the naval stores industry, which might be considerable when we consider that there is in both Washington and Oregon a belt of bare, clear sand, about seventy-five miles in length and averaging over one mile in width, making at least a total of over one hundred and fifty square miles, or about ninety-six thousand acres.

Hoquiam, Wash., June 28, 1897.

The Tacoma Academy of Science is distributing a paper giving reasons for the preservation of the name of Tacoma for that magnificent snow mountain near the city of Tacoma. It is generally known as Mount Rainier throughout the East, although the name Tacoma seems preferable for many reasons. Mt. Tacoma is 14450 feet high.

Mr. Gifford Pinchot, Secretary of the Reservation Commission, has been appointed Special Agent, and is now in the West studying the forestry conditions of the new reservations.

Mr. Henry Gannett, Geographer to the United States Geological Survey, has charge of the forestry work in connection with the survey of the new reservations.

According to the *Indian Forester*, the bicycle was invented by a forester, the Baron de Drais, Grand Verderer to the Grand Duke of Baden.

The exodus of Eastern foresters to the new Western forest reserves rivals the rush to the Klondike mines.

According to Kansas papers, hailstones as large as hen's eggs fell during a storm last month.

Minor Forest Products.

AMERICAN NAVAL STORES.

[Abridged translation by the *Indian Forester* of an article by Schleicher in the *Allgemeine Forst und Jagd-Zeitung*.]

Practically the most important result of the work of the Division of Forestry during the year 1892 was the proof of the fact that the extraction of resin from the southern species of pine does not, as is commonly supposed, influence the quality of the wood. The opinion that the timber of trees which have been tapped loses its durability is not confirmed by chemical analysis, which shows that tapping causes no alteration whatever in the chemical composition of the heart wood, as the turpentine collected all comes from the sap wood, which alone contains it in the fluid form. Nor is there any physiological reason why any such alteration should take place.

It may therefore be asserted with absolute safety that the prejudice of architects and builders against wood which has been tapped is groundless, and this view has been confirmed by actual experiment. Nevertheless, the turpentine industry is the greatest enemy of the forests of the southern States, although there is no reason why it should be so.

By tapping immature trees, and careless tapping, a great deal of unnecessary loss is caused; fire, which every year passes through the forests, destroys millions of cubic feet of very valuable timber, the dried resin left on the trees making them most inflammable, and many trees which are not actually consumed by fire are blown down by storms, and become excellent breeding places for destructive insects. For this reason, forests, five or six years after the tapping has ceased, present an appearance of utter desolation, which extends even to the young growth, so that reproduction is out of the question. In 1890 over two million acres of pine forests tapped for resin suffered from these evils, and every year the tapping is extended over from five hundred thousand to six hundred thousand acres of fresh forests.

This state of affairs led the Division of Forestry to undertake a thorough inves-

tigation of the whole system of turpentine tapping, the results of which are given below.

The principal minor forest product of the United States is tanning bark, and next to that comes turpentine, the extraction of which is confined to the pine forests of the southern States, within a belt about one hundred miles broad, bordering the Atlantic and Gulf coast lines from North Carolina to Louisiana. This industry covers a large proportion of the world's supply, amounting in value to nearly £2000,000 annually, but its importance lies even more in its bearing on the future of one of the richest sources of forest wealth in America.

Mr. Fernow is of the opinion that, owing to irrational and wasteful methods, and to the forest fires which are largely consequent thereon, the resin industry, notwithstanding the great value of the outturn is, from an economical point of view, a most unprofitable one. He hopes by his work to draw general attention to the methods of working, and to point out the means by which the evils above indicated may be avoided.

"Naval Stores" is the collective name for all resinous products. The name probably has its origin in the fact that these products were formerly mainly used for ship-building purposes, which is no longer the case, since iron has largely taken the place of timber.

Resin, or crude turpentine, as obtained from the tree is a mixture of resin and turpentine, the former being partly dissolved and partly suspended in the latter. Its consistence varies according to the species of tree from which it comes; the more oil it contains the more fluid it is.

"Fine" resin, obtained from the larch, spruce or balsam, is semi-fluid; it is more or less transparent and clear, and remains clear when exposed to the air. "Common" resin, the product of other resinous trees, is generally not quite transparent, and becomes hard as the oil evaporates. Most kinds of resin are yellow or brown colored, and turn dark on exposure to the air. They possess a characteristic smell and taste; their specific gravity is nearly 1, and they melt at a low temperature. They are insolvent in water, but dissolve readily in alcohol, ether or oil of turpentine; contain no nitrogen, little oxygen and much carbon; have a slightly acid reaction, and in combination with alkalies, form soap. The best quality is, as a rule, but not necessarily so, the product of the first year's tapping, and is known under the name of "soft white gum," or "virgin dip." In the following year the produce is called "yellow dip," and with every year it becomes darker and loses its fluidity. The scrapings, or solidified resin, is the residue which has dried on the tree.

The most important articles of commerce are obtained by the distillation of these products. The first result is oil, or spirits of turpentine. When chemically pure it is a mixture of various hydrocarbons, with the formula $C^{10} H^{16}$, while the impure article contains also other hydro-carbons and acids. Rectification is effected by adding lime water and redistilling. Oil of turpentine possesses the following qualities: when freshly made, especially from virgin trees, it is colorless, tasteless, very fluid, and has a peculiar smell; its specific gravity is 0.855 to 0.875, and its boiling point is from 150° to 160°C. Most commercial oils have a left-handed polarisation. American oil, on the other hand, is right-handed, which is a simple method of distinction. The oil is volatile at ordinary temperatures; becomes by oxidation hard and yellow, and has an acid reaction. It burns with a very sooty flame, and is insoluble in water but soluble in alcohol. It is a good solvent for many resins, wax, fats, caoutchouc, sulphur and phosphorous, and is used in the manufacture of varnish and paint. Mixed with oil, it also serves as an illuminant; it is used in medicine, both externally and internally, and probably for the adulteration of many essential oils.

Colophony is the residue after distillation of crude turpentine. Like the latter, its properties vary according to the period of its collection, and it ranges from transparency to complete opacity. The color runs through all shades, from a

bright yellow to dark brown, or nearly black. Some kinds are so soft that they can be scratched with the finger nail, and others are so hard that it requires iron to make any impression. Colophony is nearly without smell or taste, very brittle, and easily powdered. It becomes soft at a temperature of about 80°C, and melts between 90° and 100°C. As regards solubility, it resembles raw resin. Its specific gravity is 1.07. It is used in the manufacture of soap, varnish, sealing wax, cement and paper. In the American market no less than thirteen different qualities are recognized.

The following three products are obtained by the dry distillation of colophony: (1) Light colophony oil, used for varnishing; (2) heavy colophony oil, used for printers' ink, lubricating, etc.

These oils, which are known in the trade as pale oil, pine oil, printers' oil, etc., are of a red or brown color, and more or less fluorescent. They have a specific gravity of from 0.98 to 1.00, a faint smell and a characteristic taste. Distillation is carried on over a slow fire, and gives 85 per cent. of oil. These oils consist of a mixture of hydro-carbons of indeterminate nature, and contain as much as 15 per cent. of resinous acids. They are insoluble in water, slightly soluble in alcohol and do not saponify, but form insoluble combinations with slaked lime and other bases. The resin grease, which is produced by the addition of fine slaked lime, suspended in water, is a first-rate lubricant. Mixed with palm oil, colza, or the thicker mineral oils, it is used for the manufacture of lubricating oils. It is also used in the preparation of varnishes and cheap paints.

(3) Common pitch, or the residue of the dry distillation of colophony, is a shining black substance, of great bitterness, used by shoemakers and shipbuilders. Pitch can also be made by boiling tar till it has lost one-third or more of its original weight. Pitch of commerce contains more or less inferior colophony and commands a price of about six shillings per barrel of thirty gallons.

Brewers' pitch is obtained by stopping the distillation of crude turpentine before all the oil has come over. It contains, therefore, a certain quantity of turpentine oil. If the latter is in excess, the pitch smokes when melted and gives a disagreeable, sharp taste to the beer; if sufficient in quantity the pitch is brittle, and scales off in the barrels. The best quality is obtained from the larch, and comes principally from the Tyrol. A good deal of brewers' pitch is also made in the southern States of North America.

Pine tar is principally obtained by the dry distillation of wood, and most of it comes from North Carolina, where this industry has been vigorously carried on since the earliest Colonial times. In the remainder of the southern pine zone it is only made for home use.

The process of manufacture is as follows: The heart wood of perfectly dry trunks and branches of the long-leaf pine is cut into small pieces and piled up in a conical heap in a circular basin in the ground lined with clay. The center of the basin communicates, by means of a pipe, with a pit in the ground three or four feet distant from the heap. The latter is covered with turf and earth, and is treated in every way like an ordinary charcoal kiln. The flow of tar begins nine or ten days after the kindling of the kiln, and lasts for several weeks. The tar is emptied from the pit into casks of three hundred and twenty pounds, which, as a rule, are made of the same kind of wood as the tar. A "cord" of dry wood (two thousand pounds) gives from forty to fifty gallons of tar. The profits of this business are small, but it is carried on at a time when hardly any other work is practicable. The price in Wilmington, N. C., per barrel of thirty gallons was, in 1893, about four shillings and four pence, the prices having fallen in consequence of the cheaper production of tar as a by-product of charcoal-burning in iron retorts.

Finally, tar-oil is a product of the distillation of tar. It is a mixture of hydrocarbons with a little wood-spirit and a small quantity of creosote. It has a density of 0.877, and is used as an insecticide, and for external use in domestic and veterinary medicine.

The resin of commerce comes mainly from Austria, France, Corsica, Spain, Portugal, Galicia, Prussia and the United States. Most of the European turpentines are obtained from *Pinus laricio* and *Pinus maritima*, the former yielding the greatest quantity, especially in lower Austria, France and Corsica. *Pinus maritima* is principally grown in France, between Bayonne and Bordeaux, where there are one million five hundred thousand acres of forest. The larch in south Italy and the Italian Alps gives a resin of first-class quality, though only in small quantities per tree per year, which is known in trade as Venetian turpentine. Occasionally, more especially in Galicia and Russia, the spruce and Scot's pine are tapped. The turpentine of the last-named species, which is also collected in Alsace, is sold under the name of Strasburg turpentine. Hungarian turpentine is derived from *Pinus pumilio*.

(To be continued.)

Professor Fernow at Large.

The *Lumberman* received an exceedingly pleasant call Tuesday from Professor B. E. Fernow, the widely known Chief of the Division of Forestry, Department of Agriculture. He was accompanied by Mr. B. A. Tichonoff, Vice Inspector of Forestry for the Russian Government, who has been spending some time recently in this country on a tour of observation and information-gathering of the sort which representatives of foreign governments are wont to make occasionally. These two gentlemen, each distinguished and widely noted in his way, are en route for the Pacific coast, with the intention of meeting the Pacific coast excursion of lumbermen somewhere in the neighborhood of Spokane, Wash., and accompanying it during the rest of the journey. It was originally the intention of Mr. Tichonoff to accompany the excursion from St. Paul, but owing to a change in Professor Fernow's plans which enabled him also to make the trip to the Pacific coast, they will travel together, visiting some of the government's newly-established experimental forestry stations on the way out. From Chicago they went to Milwaukee to meet and confer with the newly-appointed Wisconsin commissioners, at the invitation of the latter, for the purpose of suggesting the most feasible method of putting under way a plan for obtaining a definite report upon the remaining timber resources of Wisconsin, the cut over timber lands, and other information necessary to the successful establishment of a definite forestry system.

Professor Fernow will be absent from Washington for something like three months, during which he will spend quite a portion of the time upon the Pacific coast, having, as he puts it, "a sort of roving commission," for the purpose of gathering information of use to the Division of Forestry.

The Department of Forestry of the Russian Government, of which Mr. Tichonoff is second in charge, has in its keeping 600,000,000 acres of the czar's domains, and when any astonishment is expressed at the size of the figures involved he simply shrugs his shoulders and smiles. Forestry in Russia is reduced to more of a system and more of a science than in the United States. The Russian Government, having determined to open the region of the Caucasus to the cutting of timber, sent Mr. Tichonoff to this country to investigate the export trade, in order to become thoroughly familiar with the competition the Russian lumber would have to expect from the United States in the markets of the world. Think of Uncle Sam sending Professor Fernow, or anybody else for that matter, to Russia on a similar errand! The governments of Russia, Great Britain and Germany are huge commercial machines when it comes to exploiting the business interests of either country in foreign lands. The government of the United States, which should lead the world in this regard, simply trails along at the tail end of the procession, and lets the American business man take care of himself and his own interest. A great big lesson along this line might be learned from even the smallest of foreign nations, but it seems to be a cardinal principle of the American "jingo" to learn nothing from European sources.—*Northwestern Lumberman*.

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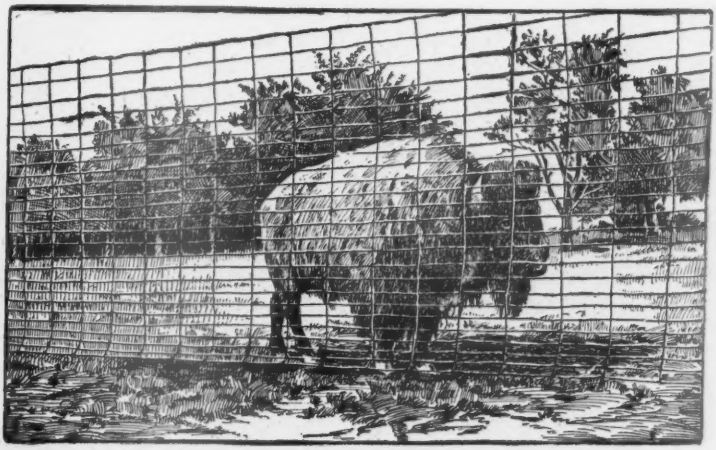

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